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Suite 500  
Chicago, Illinois USA 60631

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Oct 30<sup>th</sup>, 2015

RE: PCN # ESW490-25 -- TO-220 non-isolated and TO-263(D2PAK) lead frame design change

To our valued customers,

Littelfuse would like to notify you of a newly approved lead frame design for all TO-220 non-Isolated and TO-263(D2PAK) Thyristor products. The new lead frame design is fully approved internally. It will enable further improvement in process control, quality enhancement and productivity increase.

Qualification efforts have been completed. Please see the attached documentation for change detail and affected part numbers.

All affected products have been fully qualified in accordance with established performance and reliability criteria. The attached pages summarize the qualification results. Full qualification data and/or samples will be available upon request.

**Form, fit, function changes:** Minor (non-impact) change in backside appearance, see succeeding PCN report  
**Part number changes:** None  
**Effective date:** Jan 30<sup>th</sup>, 2016  
**Replacement products:** N/A  
**Last time buy:** N/A

This notification is for your information and acknowledgement. If you have any other questions or concerns, please contact your local sales team or Jia Zhu, Assistant Product Manager.

We value your business and look forward to assisting you whenever possible.

Best Regards,

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800 E. Northwest Highway Des Plaines, IL 60016

## Product/Process Change Notice (PCN)

**PCN#:** ESW490-25    **Date:** Oct 30, 2015

**Product Identification:**

All TO-220 non-isolated and TO-263(D2PAK)  
Thyristor Products

**Implementation Date for Change:**

Jan 30, 2016

### Contact Information

**Name:** Jia Zhu

**Title:** Assistant Product Manager

**Phone #:** +86 510 85277701 - 7966

**Fax#:** N/A

**E-mail:** jzhu3@littelfuse.com

### Category of Change:

- Assembly Process
- Data Sheet
- Technology
- Discontinuance/Obsolescence
- Equipment
- Manufacturing Site
- Raw Material
- Testing
- Fabrication Process
- Other: \_\_\_\_\_

### Description of Change:

Approve a new lead frame structure for all TO-220 non-isolated and TO-263(D2PAK) Thyristor products.

The affected products have been fully qualified in accordance with all established criteria for performance and reliability

All relevant detail is included in the supplemental pages..

### Important Dates:

Qualification Samples Available: Oct 30, 2015, sample available upon request

Last Time Buy:

Final Qualification Data Available: Oct 30,2015

Date of Final Product Shipment:

### Method of Distinguishing Changed Product

- Product Mark,
- Date Code, Start from 6BXXX
- Other,

### Demonstrated or Anticipated Impact on Form, Fit, Function or Reliability:

There is minor (non-impact) change in backside appearance of the finished product.

### LF Qualification Plan/Results:

Attached..... full detail available upon request

**Customer Acknowledgement of Receipt:** Littelfuse requests you acknowledge receipt of this PCN. In your acknowledgement, you can grant approval or request additional information. Littelfuse will assume the change is acceptable if no acknowledgement is received within 30 days of this notice. Lack of any additional response within 90 days of PCN issuance further constitutes acceptance of the change.

# PCN Report

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**Prepared By** : Maggie Xu, Senior Product Engineer  
**Date** : Oct 12th, 2015  
**Device** : TO-220 non-isolated /TO-263(D2Pak) series Package Product  
**Revision** : A

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## 1.0 Objective:

The purpose of this project is to qualify a new lead frame design for Thyristor TO-220 non-isolated and TO-263 (D2Pak) products.

## 2.0 Applicable Devices:

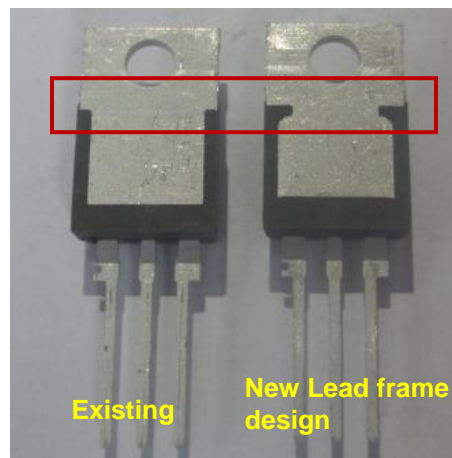
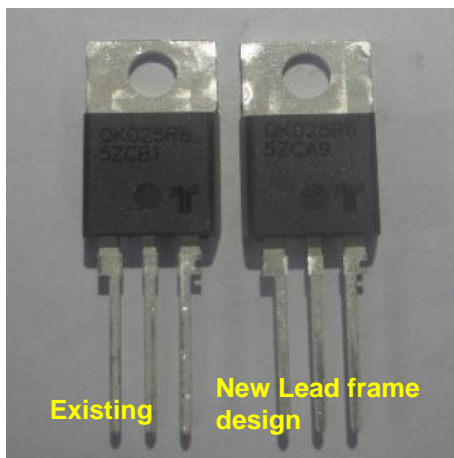
Thyristor TO-220 non-isolated and TO-263 (D2Pak) Product Series

## 3.0 Packing Method:

There will be no changes in the packing method.

## 4.0 Physical Differences/Changes:

- 1) There will be no change in physical dimension and marking.
- 2) No change on topside of finished goods, minor (non-impact) change in backside appearance of finished goods.



### 5.0 Reliability Test Results Summary:

Test Category	Description	Sample P/N	Sample Qty	Littelfuse test Ref#	Contents/Conditions	Result Summary
Parametric Test	Electrical Parameters	QK004R4	25	68343 68112	IGT/VGT/IH/VT>IDRM/IRRM	Meet datasheet spec
		QK008RH4	25	67681		
		Q6016RH6	25	67347		
		QK025R6	25	68343 68139		
		QK025N6	25	68109		
		S6010RS2	25	68344 68156		
		S4040RQ3	25	68105		
		SK055NRP	25	68345 67687		
	ITSM	QK004R4	5	68112	Full cycle; f = 50Hz; T <sub>J</sub> (initial) = 25°C	
		QK008RH4	5	67681		
		Q6016RH6	5	67347		
		QK025R6	5	68139		
		QK025N6	5	68109	Single half cycle; f = 50Hz; T <sub>J</sub> (initial) = 25°C	
		S6010RS2	5	68156		
		S4040RQ3	5	68105		
		SK055NRP	5	67687		
	IGT/IH/VGT vs. Temp	QK025R6	5	68139	-40°C, -20°C, 0°C, 25°C, 50°C, 85°C, 100°C, 125°C	
		S6010RS2	5	68156		
		S4040RQ3	5	68105		
		SK055NRP	5	67687		
	Tgt	QK025R6	5	68139	IG=2 x IGT, P <sub>W</sub> =15μs	
		S6010RS2	5	68156		
		S4040RQ3	5	68105		
		SK055NRP	5	67687		
	Tq	S6010RS2	5	68156	IT=0.5A	
		S4040RQ3	5	68105		
		SK055NRP	5	67687		
	Static dv/dt	QK025R6	5	68139	T <sub>J</sub> =125°C, VD=VDRM	
		S6010RS2	5	68156	T <sub>J</sub> =110°C, VD=VDRM	
		S4040RQ3	5	68105	T <sub>J</sub> =125°C, VD=VDRM	
		SK055NRP	5	67687		
	Commutation dv/dt	QK025R6	5	68139	T <sub>J</sub> =125°C	
	VT vs. IT	QK008RH4	5	67681		
		Q6016RH6	5	67347		
		QK025R6	5	68139		
		S6010RS2	5	68156		
S4040RQ3		5	68105			
SK055NRP		5	67687			

	Thermal Resistance	QK008RH4	3	67681		
		Q6016RH6	3	67347		
		QK025R6	3	68139		
		S6010RS2	3	68156		
Reliability Test	AC Blocking	QK004R4	77	75850	Ta:125°C, Reverse biased at 1000Vpeak AC	0 failure at 1,008hr read point
		Q6006RH3	77	75853	Ta:125°C, Reverse biased at 600Vpeak AC	
		QK008RH4	77	67676	Ta:125°C, Reverse biased at 1000Vpeak AC	
		Q6016RH6	77	67344	Ta:125°C, Reverse biased at 600Vpeak AC	
		QK025R6	77	68132	Ta:125°C, Reverse biased at 1000Vpeak AC	
		QK025N6	77	68106	Ta:125°C, Reverse biased at 1000Vpeak AC	
		S6010RS2	77	75852	Ta:110°C, Reverse biased at 600Vpeak AC	
		S4040RQ3	77	68103	Ta:125°C, Reverse biased at 400Vpeak AC	
		SK055NRP	77	67682	Ta:125°C, 1,008hr, Reverse biased at 1000Vpeak AC	
	Pre-condition	QK025N6	154	68106	24hrs 125°C bake, 168hrs 85°C/85% humidity storage, 3 x IR reflow	0 failure after pre-condition
		SK055NRP	154	67682		
	High Humidity High Temp. Reverse Bias (H3TRB)	QK004R4	77	75850	Ta: 85°C, RH: 85%, Reverse biased at 320V <sub>DC</sub>	0 failure at 1,008 hr read point
		Q6006RH3	77	75853	Ta: 85°C, RH: 85%, Reverse biased at 160V <sub>DC</sub>	
		QK008RH4	77	67676	Ta: 85°C, RH: 85%, Reverse biased at 320V <sub>DC</sub>	
		Q6016RH6	77	67344	Ta: 85°C, RH: 85%, Reverse biased at 160V <sub>DC</sub>	
		QK025R6	77	68132	Ta: 85°C, RH: 85%, Reverse biased at 320V <sub>DC</sub>	
		QK025N6	77	68106	Ta: 85°C, RH: 85%, Reverse biased at 320V <sub>DC</sub>	
		S6010RS2	77	75852	Ta: 85°C, RH: 85%, Reverse biased at 160V <sub>DC</sub>	
		S4040RQ3	77	68103	Ta: 85°C, RH: 85%, Reverse biased at 160V <sub>DC</sub>	
		SK055NRP	77	67682	Ta: 85°C, RH: 85%, Reverse biased at 320V <sub>DC</sub>	
	Temperature Cycling (TC)	QK004R4	77	75850	-40°C&150°C (air to air), Dwell time 15mins	0 failure at 1000 cycle read point
		Q6006RH3	77	75853		
		QK008RH4	77	67676		
		Q6016RH6	77	67344		
		QK025R6	77	68132		
QK025N6		77	68106			
S6010RS2		77	75852			
S4040RQ3		77	68103			
SK055NRP		77	67682			
Resistance to Solder Heat	QK025R6	30	68343	260°C, 10 seconds	0% failure after RSH	
	S6016RS2	30	68344			

	(RSH)	SK055NRP	30	68345		
Solderability		QK004R4	10	68343	245°C, 10 seconds	0% failure in visual inspection
		QK025R6	10	68343		
		S6016RS2	10	68344		
		SK055NRP	10	68345		
Physical Dimension		QK004R4	30	68343		Meet datasheet spec
		QK025R6	30	68343		
		SK055NRP	30	68345		
ESD		S6010RS2	60	68344	HBM, CDM	0% failure after ESD
Mounting Test		QK004R4	10	68112	MIL-STD-750, Method 2036, D2	Meet datasheet spec
		QK008RH4	10	67681		
		QK025R6	10	72188		
		S4040RQ3	10	73339		
Lead bending Test		QK025R6	45	70839	MIL-STD-750, Method 2036, E	0 failure in lead visual inspection

#### 6.0 Electrical Characteristic Summary:

There is no change in electrical characteristics. Characterization data is available upon request.

#### 7.0 Changed Part Identification:

There is no change in part identification.

#### 8.0 Recommendations & Conclusions:

Based on the test results, it is determined that the new lead frame design is qualified and certified for Thyristor TO-220 non-isolated and TO-263 (D2Pak) product series.

#### 9.0 Approvals:

Maggie Xu  
Thyristor Product Engineer  
Littelfuse, WUXI

Zhiwei Wang  
Product Engineer Manager  
Littelfuse, WUXI



**Affected Part Number List**

HQ6025NH5RP	Q4006R4	Q4016NH2TP	Q6008N4RP	Q6015N5RP	Q8006NH4TP
HQ6025NH5TP	Q4006R5	Q4016NH3RP	Q6008N4TP	Q6015N5TP	Q8006R5
HQ6025RH5	Q4006RH3	Q4016NH3TP	Q6008N5RP	Q6015R5	Q8006RH4
HQ6025RH5TP	Q4006RH3TP	Q4016NH4RP	Q6008N5TP	Q6015R5TP	Q8006RH4TP
L4004R3	Q4006RH4	Q4016NH4TP	Q6008NH1LEDRP	Q6016NH2RP	Q8008N5RP
L4004R5	Q4008N4RP	Q4016NH6RP	Q6008NH1LEDTP	Q6016NH2TP	Q8008N5TP
L4004R6	Q4008N4TP	Q4016NH6TP	Q6008NH3RP	Q6016NH3RP	Q8008NH4RP
L4004R8	Q4008N5RP	Q4016RH2	Q6008NH3TP	Q6016NH3TP	Q8008NH4TP
L6004R3	Q4008N5TP	Q4016RH3	Q6008NH4RP	Q6016NH4RP	Q8008R5
L6004R5	Q4008NH3RP	Q4016RH4	Q6008NH4TP	Q6016NH4TP	Q8008RH4
L6004R6	Q4008NH3TP	Q4016RH6	Q6008R4	Q6016NH6RP	Q8008RH4TP
L6004R8	Q4008NH4RP	Q4025N5RP	Q6008R5	Q6016NH6TP	Q8010N4RP
L6004R8TP	Q4008NH4TP	Q4025N5TP	Q6008R559	Q6016RH2	Q8010N4TP
L6006R5	Q4008R4	Q4025NH5RP	Q6008RH1LED	Q6016RH3	Q8010N5RP
L6006R6	Q4008R456	Q4025NH5TP	Q6008RH1LEDTP	Q6016RH3TP	Q8010N5TP
L6008R6	Q4008R5	Q4025NH6RP	Q6008RH3	Q6016RH4	Q8010NH5RP
L6008R8	Q4008RH3	Q4025NH6TP	Q6008RH3TP	Q6016RH4TP	Q8010NH5TP
L6008R8TP	Q4008RH3TP	Q4025R5	Q6008RH4	Q6016RH6	Q8010R4
Q1257Q6008RH4	Q4008RH4	Q4025R6	Q6008RH4TP	Q6016RH6TP	Q8010R5
Q1309Q4008RH4TP	Q4010N4RP	Q4025R6TP	Q6010N4RP	Q6025N5RP	Q8010R5TP
Q1334Q2016RH4	Q4010N4TP	Q4025RH5	Q6010N4TP	Q6025N5TP	Q8010RH5
Q1384Q6016RH6	Q4010N5RP	Q4025RH5TP	Q6010N5RP	Q6025NH5RP	Q8012NH2RP
Q1384Q6016RH6TP	Q4010N5TP	Q4035NH5RP	Q6010N5TP	Q6025NH5TP	Q8012NH2TP
Q1395Q4004R4	Q4010NH5RP	Q4035NH5TP	Q6010NH5RP	Q6025NH6RP	Q8012NH5RP
Q1396Q4004R4LBTP	Q4010NH5TP	Q4035RH5	Q6010NH5TP	Q6025NH6TP	Q8012NH5TP
Q1397Q4004R4LBTP	Q4010R4	Q4035RH5TP	Q6010R4	Q6025R5	Q8012RH2
Q1398Q4006R4LB	Q4010R5	Q6004R3	Q6010R4TP	Q6025R5TP	Q8012RH5
Q1399L4004R3LB	Q4010R552	Q6004R4	Q6010R5	Q6025R6	Q8012RH5TP
Q1400L4004R3LB	Q4010R5TP	Q6006N4RP	Q6010RH5	Q6025R6TP	Q8015N5RP
Q1401L4004R3LB	Q4010RH5	Q6006N4TP	Q6012NH1LEDRP	Q6025RH5	Q8015N5TP
Q1403L6004R5	Q4012NH2RP	Q6006N5RP	Q6012NH1LEDTP	Q6025RH5TP	Q8015R5
Q1410Q8025R6	Q4012NH2TP	Q6006N5TP	Q6012NH2RP	Q6025RX	Q8016NH2RP
Q4004R3	Q4012NH5RP	Q6006NH4RP	Q6012NH2TP	Q6035NH5RP	Q8016NH2TP
Q4004R4	Q4012NH5TP	Q6006NH4TP	Q6012NH5RP	Q6035NH5TP	Q8016NH3RP
Q4006N4RP	Q4012RH2	Q6006R4	Q6012NH5TP	Q6035RH5	Q8016NH3TP
Q4006N4TP	Q4012RH5	Q6006R5	Q6012RH1LED	Q6035RH5TP	Q8016NH4RP
Q4006N5RP	Q4015N5RP	Q6006RH3	Q6012RH1LEDTP	Q8004R4	Q8016NH4TP
Q4006N5TP	Q4015N5TP	Q6006RH352TP	Q6012RH2	Q8006N5RP	Q8016NH6RP
Q4006NH4RP	Q4015R5	Q6006RH3TP	Q6012RH5	Q8006N5TP	Q8016NH6TP
Q4006NH4TP	Q4016NH2RP	Q6006RH4	Q6012RH5TP	Q8006NH4RP	Q8016RH2



Q8016RH3	QK012NH5RP	S4012RTP	S6008RTP	S8016RTP	SK055NRP
Q8016RH4	QK012NH5TP	S4016NRP	S6010R	S8025NRP	SK055NTP
Q8016RH4TP	QK012RH2	S4016NTP	S6010RS2	S8025NTP	SK055R
Q8016RH6	QK012RH5	S4016R	S6010RS3	S8025R	SRR6020NRP
Q8016RH6TP	QK015N5RP	S4016RTP	S6010RTP	S8025RTP	SRR6020NTP
Q8025N5RP	QK015N5TP	S4025NRP	S6012R	S8040NRP	SRR6020R
Q8025N5TP	QK015R5	S4025NTP	S6012RTP	S8040NTP	SRR6020RTP
Q8025NH5RP	QK016NH2RP	S4025R	S6016NRP	S8040R	
Q8025NH5TP	QK016NH2TP	S4025RTP	S6016NTP	S8055NRP	
Q8025NH6RP	QK016NH3RP	S4040NQ2RP	S6016R	S8055NTP	
Q8025NH6TP	QK016NH3TP	S4040NQ2TP	S6025NRP	S8055R	
Q8025R5	QK016NH4RP	S4040NQ3RP	S6025NTP	S8055RTP	
Q8025R6	QK016NH4TP	S4040NQ3TP	S6025R	S832S4025R51TP	
Q8025R6TP	QK016NH6RP	S4040NQRP	S6025R56TP	S844S8010R	
Q8025RH5	QK016NH6TP	S4040NQTP	S6025R59TP	S845S8010R	
Q8025RH5TP	QK016RH2	S4040NRP	S6025RTP	S860S4055RLBTP	
QK004R4	QK016RH3	S4040NTP	S6040NRP	S895S6008RS2	
QK006N5RP	QK016RH4	S4040R	S6040NTP	S935S6025RLB	
QK006N5TP	QK016RH6	S4040RQ	S6040R	S935S6025RLBTP	
QK006NH4RP	QK025N5RP	S4040RQ2	S6040RTP	S937S6055RLBTP	
QK006NH4TP	QK025N5TP	S4040RQ2TP	S6055NRP	S946S4012RTP	
QK006R5	QK025NH6RP	S4040RQ3	S6055NTP	SK006R	
QK006RH4	QK025NH6TP	S4040RQ3TP	S6055R	SK006RTP	
QK008N5RP	QK025R5	S4040RTP	S6055RTP	SK008R	
QK008N5TP	QK025R5TP	S4055NRP	S667S6008R	SK008RTP	
QK008NH4RP	QK025R6	S4055NTP	S667S6008RTP	SK010R	
QK008NH4TP	QK025R6TP	S4055R	S753S0508R	SK010RTP	
QK008R5	S4006R	S4055RTP	S784S6008R67RP	SK012R	
QK008RH4	S4006RS2	S512S0540RLB	S785S6025RLB	SK016NRP	
QK010N4RP	S4006RS265	S556S2025R	S785S6025RLBTP	SK016NTP	
QK010N4TP	S4006RS3	S593S8008R	S8006R	SK016R	
QK010N5RP	S4006RTP	S6006R	S8006RTP	SK016RTP	
QK010N5TP	S4008R	S6006RS2	S8008R	SK025NRP	
QK010NH5RP	S4008RS2	S6006RS3	S8008RTP	SK025NTP	
QK010NH5TP	S4008RS3	S6006RTP	S8010R	SK025R	
QK010R4	S4008RTP	S6008R	S8010RTP	SK025RTP	
QK010R5	S4010R	S6008R67	S8012R	SK040NRP	
QK010RH5	S4010RS2	S6008RS2	S8016NRP	SK040NTP	
QK012NH2RP	S4010RS3	S6008RS3	S8016NTP	SK040R	
QK012NH2TP	S4012R	S6008RS3TP	S8016R	SK040RTP	